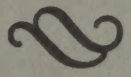
PNEUMONIA

Its Etiology, Diagnosis and Treatment



Prepared by
THE COMMITTEE ON PNEUMONIA CONTROL
representing the
TENNESSEE DEPARTMENT OF PUBLIC HEALTH
and
TENNESSEE STATE MEDICAL ASSOCIATION
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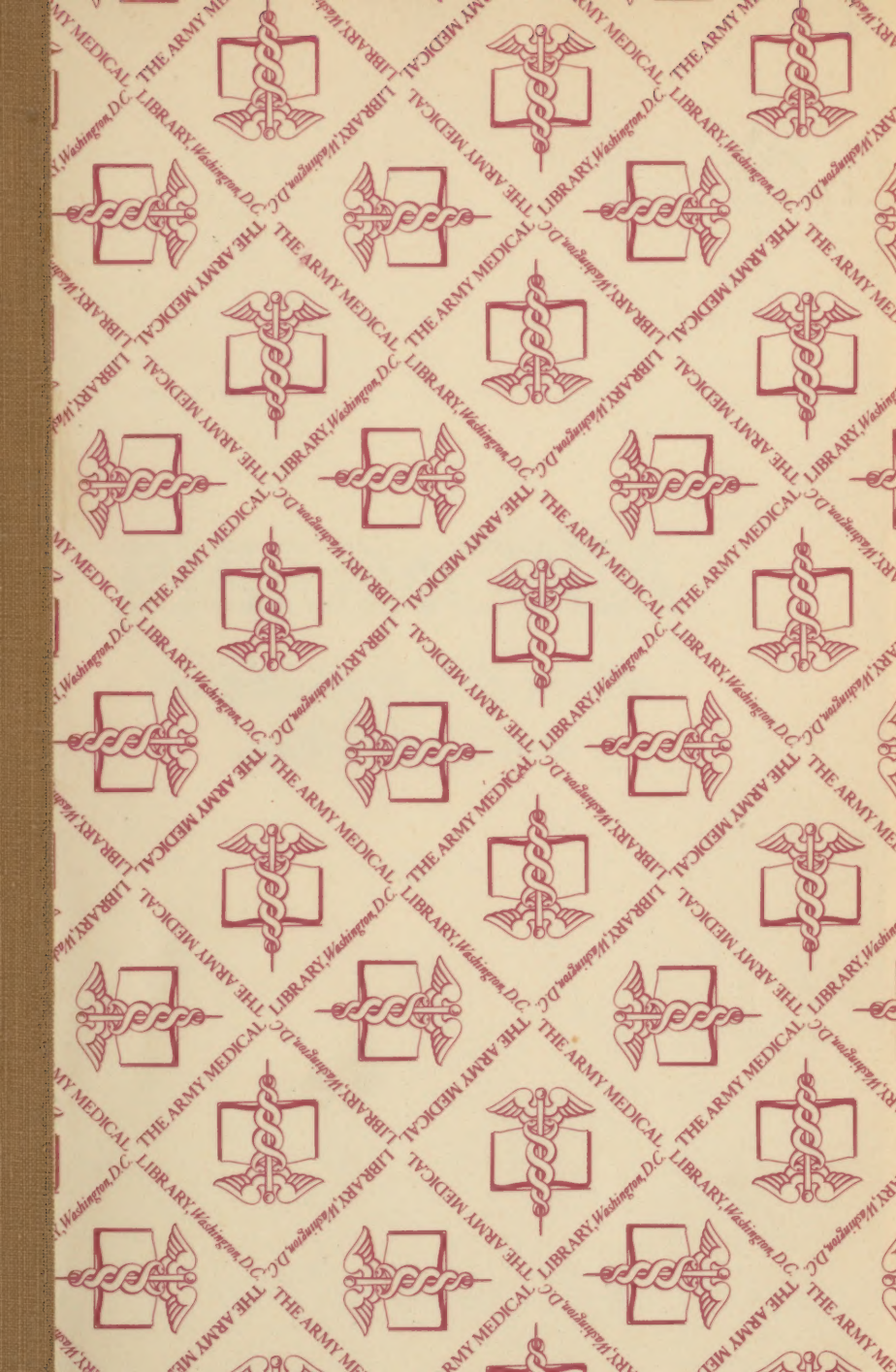
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PNEUMONIA

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FOREWORD

Pneumonia is among the foremost causes of death in the United States. Among the acute infectious diseases it ranks first as a cause of death. In Tennessee in 1939 it was, according to the official records, fifth in the order of the principal causes of death, being outranked only by (1) diseases of the heart, (2) cerebral hemorrhage, embolism, etc., (3) tuberculosis (all forms) and (4) cancer. The number of deaths reported from pneumonia (all forms) in Tennessee in the five-year period, 1935-39, averaged annually 2,693, with rates per 100,000 population of 100.8, 123.1, 98.1, 84.1 and 73.4 for 1935, 1936, 1937, 1938 and 1939, respectively. These data indicate the magnitude and seriousness of the pneumonia problem in this state.

Though most of the pneumonias are of an infectious nature, the epidemiological evidence at present is that procedures to prevent on a reasonably adequate scale the spread of the infectious agents would be impracticable. Our most strategic attack on the problem immediately, therefore, appears to be the provision of measures for the prompt and proper care and treatment of persons who develop the disease. The promise of such an attack has been greatly enhanced within the last few years by the revolutionary development of new knowledge and remedies applicable in the treatment of the disease. Of outstanding importance is the production of highly effective drugs (sulfapyridine and sulfathiazole) and specific antisera. The addition of these remedies to the physicians' armamentarium furnishes a great opportunity to, and also places a large responsibility upon, health agencies and practitioners of medicine to have these remedies utilized in the best way possible.

The Tennessee Department of Public Health and Tennessee State Medical Association with financial assistance from the U. S. Public Health Service have planned a cooperative state-wide program of pneumonia control in Tennessee. Success of the program depends upon the degree of intelligent, whole-hearted participation by organized public health and medical agencies, the individual practitioners of medicine and our general citizenry. The object is to reduce the suffering, incapacitation, and mortality caused unnecessarily by pneumonia. A fair measure of success hoped for and reasonably anticipated will be a marked reduction in the death rate from pneumonia in Tennessee within the next few years.

This booklet has been prepared by representatives of the Tennessee Department of Public Health and the Committee on Pneumonia Control of the Tennessee State Medical Association. Its purpose is to provide in convenient ready-reference form an outline of salient and practically important facts regarding the causation, diagnosis, and treatment of pneumonia, the plan for distribution of drugs and other salient features of the proposed control program.

In preparing the text of this pamphlet, freedom has been exercised in drawing upon the published works of others—particularly pamphlets of similar general nature issued by the respective state health departments and used in pneumonia control programs in New York, Iowa, and Illinois. Grateful acknowledgment hereby is made for information obtained from these and other sources.

W. C. WILLIAMS, M. D., Commissioner,
Tennessee Department of Public Health

December 1, 1940

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SECTION I

DEFINITION AND ETIOLOGY

Pneumonia may be defined broadly as an acute inflammatory process involving the parenchyma of the lung. It is not a single disease entity but is a number of diseases due to the operations of different and, to a large extent, distinguishable causative factors of which some are infectious and others are non-infectious. The vast majority of cases of pneumonia are caused by specific bacterial agents of which the pneumococci as a group are by far the most important; but some appear to be due primarily to viruses or to chemical or physical (non-infectious) agents. Flippin's Etiological Classification of Pneumonias is as follows:

A. Specific Pneumonia
   1. Coccal—PNEUMOCOCCUS,* streptococcus, staphylococcus, etc.
   2. Bacillary—Tuberculosis, influenza, tularemia, etc.
   3. Virus—Influenza, psittacosis, measles, etc.

B. Systemic Disease with Pneumonia
   1. Bacillary—Tuberculosis, tularemia, brucellosis, typhoid, diphtheria, etc.
   2. Rickettsial—Typhus fever, Rocky Mountain spotted fever.
   3. Rheumatic fever.

C. Secondary Pneumonia
   1. Senility, acute and chronic disease, shock, mechanical causes, etc.
   2. Usually a mixed infection.

D. Special Forms of Pneumonia
   1. Oil aspiration
   2. Radiation
   3. Chemical
   4. Allergy

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*Primary or typical Pneumonia (92% pneumococci)—Pneumococcal Pneumonia (95% lobar)

In the classification presented in our textbooks of many years a distinction based on clinical aspects and pathological anatomy has been made between lobar pneumonia and bronchopneumonia or lobular pneumonia. Such distinction remains of practical importance because of the difference between these two anatomical forms of pneumonia in the age distribution of cases, in the influence of other primary diseases upon incidence and in the variety of specific bacterial infections responsible—bronchopneumonia having a comparatively higher distribution than lobar pneumonia at the extremes of life and as a secondary or terminal disease development resulting often from intercurrent infection. It is now recognized, however, that for purposes of treatment and prognosis the determination of the nature of the causative agent as thoroughly and promptly as may be practicable is vastly more important than any fine anatomical distinction.

Studies of a number of series of thousands of cases reveal that over 81 per cent of the cases of lobar pneumonia and bronchopneumonia, considered together, are due to pneumococci, about 10 per cent to streptococci, about 1 per cent to staphylococci, and about 1 per cent to Friedlander's bacillus, with the remainder due apparently to mixed infections or to unidentified agents. Other studies reveal that approximately 95 per cent of cases of lobar pneumonia and about 50 per cent of cases of bronchopneumonia are incited by pneumococci. Thus, pneumococcus pneumonia furnishes the main field for attack and it also, fortunately, is the pneumonia which, as a rule, is most amenable to efficient present-day treatment methods.

Over thirty types of pneumococci have been identified. They are classified by number. In pneumococcus lobar pneumonia in persons of all ages, Types 1, 2, and 3, as a group, are the inciting agents generally in about 63 per cent of cases, Type 1 being the agent in about three times as many, and Type 2 in about twice as many as Type 3. The pneumococcus is the most common single invader in bronchopneumonia, but other organisms frequently are the cause.

In pneumococcus pneumonia in **adults** the order of predominance of the different types of pneumococci as causative agents found in some of the larger series of cases studied was about as follows:

Lobar pneumonia, Types 1, 2, 3, 5, 8, 7, 4, and 14;

Bronchopneumonia, Types 3, 8, 10, 20, 7, 18, 5, 6, and 1.

In pneumonia in **children,** pneumococci are found as the inciting agents in about two-thirds and other organisms in about one-third of the cases. The order of occurrence of types is about as follows:

Children two to twelve, Types 1, 14, 6, 19, and 5;

Infants under two, Types 14, 6, and 19.

In the treatment of pneumococcus pneumonia, the determination of the type of the causative organism is important in chemotherapy and essential in reliable serum therapy. The use of a specific antiserum without knowledge of the specific type of the causative organism is an exceedingly unsound routine practice. Where laboratory facilities are entirely unavailable for the examination of sputum and blood, the guessing may be based on the law of averages in selecting the serum to be used in cases where chemotherapy has failed. For instance, antiserum for Type 1 pneumococcus would be the best guess for a patient between ten and fifty years of age with clinically typical lobar pneumonia. Guessing as to type must be vigorously discouraged.

Much remains to be learned about the ecology of the pneumococci. The types predominating as causative factors of pneumonia vary in different geographical regions at the same time and in the same region at different times. Types 1 and 2 appear to be among the most highly infectious. Types up to and including Type 19, excepting Types 1, 2, 5, 7, and 8, appear to be as prevalent in the general population as in persons in close association with cases of the disease. The epidemiological evidence so far is that, generally, healthy carriers are more important than clinically recognizable cases in spreading the pneumococci infections. The development of the carrier state is especially likely to occur among household associates with cases due to infection with Types 1 or 2.

Much also remains to be learned as to what constitutes individual susceptibility to pneumonia. Why at a given time in a group of closely associated persons with all in good health, one develops pneumonia and the others do not is usually without

any discernible reason. Among the factors generally regarded as predisposing or precipitating are age, season, other infections, impairment of pulmonary circulation, exposure to cold and wet, undue fatigue, injuries due to accidents, surgical operations, childbirth, and acute alcoholism.

The mortality is highest at the extremes of life—in infancy and old age.

The incidence in four-season climates is highest during and immediately before and after the cold weather period. The cold weather seasonal influence perhaps operates on the host through quick changes from indoor to outdoor or from outdoor to indoor temperatures and humidities, to over-crowding, less sunshine, etc., and it possibly operates also upon the viability, virulence and invasiveness of the causative organisms.

The frequent sequential association with apparently minor acute upper-respiratory ailments suggests that what causes some of the "ordinary colds" is either a predisposing factor to or an actual part of the infectious invasion resulting in pneumonia. Influenza-pneumonia, which occurs with appalling frequency in the course of influenza epidemics, appears to be due in some cases to the primary virus infection and in others (perhaps the majority) to secondary bacterial infections. Measles and whooping cough are important predisposing factors.

NOTE: The statements in this booklet regarding the proportions of different causative organisms of the pneumonias are based largely on data presented in CHEMOTHERAPY AND SERUM THERAPY OF PNEUMONIA by Lord, Robinson, and Heffron, published by the Commonwealth Fund.

SECTION II

DIAGNOSIS

The diagnosis of pneumonia according to its anatomical forms, as lobar pneumonia or bronchopneumonia, is often of practical value, but, with the advent of highly effective therapeutic measures for pneumococcus pneumonia and some of the other pneumonias caused by bacterial infections, the accurate and early diagnosis of pneumonia according to its etiological nature is critically important. Moreover, since all therapeutic measures have a much greater effectiveness if applied early, within the first two or three days after the onset of the illness, prompt diagnosis also is critically important. The main value of differential diagnosis between lobar pneumonia and bronchopneumonia, obtaining especially in the absence of laboratory facilities, is in furnishing a general sort of clue to etiology, some of the inciting agents being more common in one than in the other. It should be kept in mind, however, that pneumococci or other inciting agents may be responsible for either of these anatomical forms of the disease.

In the diagnosis of pneumococcus pneumonia, clinical history, general observation, physical and x-ray examinations, and certain laboratory procedures all are of practical importance.

Clinical—Few pathological conditions present clinically more definite and constant symptoms and signs than does primary pneumococcus lobar pneumonia in persons ten to fifty years of age. The onset often is preceded by evidence of a mild acute upper respiratory infection, but, whether or not so preceded, it usually is sudden or abrupt with pain in the chest, cough and chill or chilliness followed by a rapidly rising temperature reaching, as a rule 102° to 104° F. within a few hours. Usually the cough at first is dry and hacking but it soon becomes productive. The sputum at the beginning of the productive cough may be thin and blood streaked but usually within twenty-four hours afterward it is tenacious and rusty with the "brick dust" coloring thoroughly integrated with it. As a rule, the fever is continuous with only slight diurnal fluctuations and, in cases

terminating favorably without special therapy, falls by crisis or rapid lysis in from five to ten days. The fall in the temperature usually is followed immediately by a marked amelioration of the other symptoms along with a change in the sputum to a more purulent and less tenacious character. In some exceptional cases the duration of the active disease process may be as short as two or three days and in others as long as two or three weeks or more. During the febrile period, flushing of the face and rapid respiration and pulse rates are usual. Herpes of the lips is quite common. Among the usual physical signs within the first twenty-four hours of the attack are slight dullness on percussion, diminished and bronchial breathing, and fine moist rales, and by the second or third day marked dullness, bronchial breathing and increased voice sounds and tactile fremitus over the involved lung area. If the area involved is confined to one or more lobes of one lung, motion of the affected side usually by the second or third day is restricted. X-ray examinations usually will give a definite picture of the area of involvement and may be of help not only in early diagnosis but also in determining from time to time the course of the disease process. A polymorphonuclear leukocytosis occurs in almost all (over 95 per cent) of the cases, the counts ranging usually from 15,000 to 50,000 and occasionally as high as 100,000 or more. Leukocytosis is usually present within the first few hours after the onset of the illness and throughout the attack. An absence of leukocytosis in the early period of the disease or a marked decrease in the leukocyte count or the development of leukopenia in the course of the disease is to be regarded generally as of grave significance with respect to prognosis and in some instances to therapeusis.

Exceptionally in persons ten to fifty years of age, and more commonly in young children and in elderly persons, pneumococcus lobar pneumonia may have a comparatively gradual and insidious onset and an irregular clinical course with masking of symptoms and physical signs. However, by careful and competent clinical study, most of the clinical features of diagnostic value can be brought to light.

Bronchopneumonia whether caused by pneumococci or other bacterial agents or by viruses usually has a less frank onset and a more irregular course than does pneumococcus lobar pneumonia. Cases due to infection with the more wide-spread bacterial

agents are comparatively frequent in young children and elderly persons and in persons of any age who have some other preceding disease. It usually can be differentiated from lobar pneumonia by clinical history and course, physical signs and x-ray examination.

Cases of pneumonia due to infection with bacteria other than pneumococci or to virus infection are generally of the bronchopneumonia form. The area of lung involvement in some cases is larger than that usual in lobar pneumonia. In the virus pneumonias, leukocytosis usually is absent.

Streptococcus pneumonia is especially likely to occur in the course of or immediately following epidemics of influenza or of measles. It is often preceded immediately by a sore throat. Its onset is usually less explosive than that of pneumococcus lobar pneumonia, the sputum is seldom bloody, and pleurisy with effusion is comparatively frequent. Its anatomical form usually is that of bronchopneumonia but in some cases is lobar.

In staphylococcus pneumonia the onset usually is not explosive, and the quite frequent, dirty, salmon-pink, purulent character of the sputum may furnish a diagnostic lead.

In Freidlander's bacillus pneumonia the onset usually is sudden with symptoms similar to those of pneumococcus lobar pneumonia. As a rule, the physical signs are those of a densely confluent bronchopneumonia. The sputum may be blood-streaked or rusty or consist of almost pure blood and in some cases is of a striking mucoid character.

Epidemiological evidence along with the clinical evidence is of use in the diagnosis of the pneumonias due to or coincident with the infections of influenza, psittacosis, tularemia, and plague. Pneumonic plague with its severe course tending to rapid fatal termination and its main characteristics including early extreme prostration and the presence of plague bacilli in the sputum presents no particular difficulty of diagnosis after the first case is recognized in a community.

A pneumonia presenting unusual difficulties in diagnosis has been found in this country more commonly during the last two or three years than previously. It appears to be a clinical entity.

Its etiology is unknown, but a virus, of course, is suspected. It may have a considerable incidence in a short period of time in a community. Its clinical manifestations are fairly regular. The onset and the appearance of physical signs are gradual and dullness and suppressed breath sounds may be the only abnormal findings from physical examination of the chest. X-ray examination shows irregular and often diffuse infiltration. Usually, cyanosis is marked; the febrile period continues two or three weeks or more. The course of this variety of pneumonia does not appear to be influenced favorably by the use of any of the special remedies which are highly effective in the pneumococcus pneumonias.

Among conditions to be considered in undertaking clinically to make differential diagnosis of pneumonia, generically as a pathological process, are the following: influenza (without pneumonic involvement), pulmonary tuberculosis, pleurisy with effusion, pulmonary infarction, lung abscess, acute coronary thrombosis acute appendicitis (especially in children), acute pyelitis, meningitis, intercostal neuralgia, tabetic crisis, subdiaphragmatic abscess, pulmonary trichiniasis, perforated peptic ulcer, acute cholecystitis, etc.

The skilled clinician may make from clinical history and manifestations alone a correct differential diagnosis of pneumonia in the large majority of cases, but our most skilled clinicians of these times use most, whenever and wherever available, the diagnostic aids furnished by the laboratory. Fortunately, primary pneumococcus lobar pneumonia, which comprises a large proportion of all of the pneumonias, presents, as a rule, a sufficiently definite and characteristic clinical picture to warrant, in the absence of laboratory facilities, a practical diagnosis and the prompt institution of the chemotherapy which is effective in this and in the other generally common bacterial pneumonias.

Bacteriological—Blood cultures and sputum examinations are among the laboratory procedures of primary importance to aid in the accurate etiological diagnosis of the pneumonias. They are employed to determine whether the inciting agent is a bacterium and, if so, what bacterium, and, if a pneumococcus, what type of pneumococcus. Obviously, either positive or negative findings are of diagnostic value.

Blood cultures, if bacteriologically positive, furnish maximum specific information which is critically important for purposes of both therapeusis and prognosis. Under otherwise comparable conditions, cases with bacteriemia have a case fatality rate about three times as high as that of cases without it. Pneumococci found in the blood of a patient are practically always of a single type. The typing of the organisms found in the culture provides definite specific etiological evidence. Bacteriemia occurs usually in the very early stage of the disease. Therefore, if blood is to be taken for culture, the blood should be taken promptly and taken before chemotherapy is begun. A positive blood culture may enable the isolation and identification of the causative organism when other methods fail and, though twelve to eighteen hours or more may elapse before the organisms in the culture become sufficiently numerous for typing, the chemotherapy can be carried out while the report from the laboratory is being awaited. After a positive report is received, serum or other additional treatment may be begun in time to have important effect if the patient already has not responded favorably to the chemotherapy.

Sputum examination is important in the differential diagnosis of pneumonia from other diseases and in the determination of the etiological type of the disease if it is pneumonia. It is of specific value in differentiating by types pneumococci in sputum from patients with pneumococcus pneumonia. It is desirable in all cases of diagnosed or suspected pneumonia. Determination of the type of the infecting organism is necessary for proper treatment with type specific antipneumococcus serum.

Typing of pneumococci in sputum has the advantages of simplicity and quickness. If the organisms are abundant, the procedure may be completed within thirty or forty minutes. If scarce, more tedious procedures, including animal inoculation or culturing with some specimens, may be required. If pneumococci of two or more types are found in about equal numbers, those of the lower type number are to be regarded as the more likely inciting agent. If the pneumococci are either scarce or of multiple types, repeat specimens of sputum are desirable. The finding of pneumococci of Type 1 or 2 in the sputum from a patient with clinical pneumonia is very strong evidence that the

organism found is the cause of the infection. The same holds to an almost equal degree for Types 5, 7, and 8.

The sputum for examination should be that which is coughed up and be as free as is practicable from naso-pharyngeal secretion and saliva. The amount should be equal to one teaspoonful, but a smaller amount, as that obtained by swabbing, may prove sufficient. The typing should be done very soon—within two to twelve hours—after the sputum is coughed up; but satisfactory results often can be obtained if the delay is longer, provided always the sputum is kept at body temperature.

Detailed descriptions of procedures to obtain and to transfer to the examining laboratories specimens of blood and sputum and the methods of reporting findings are presented in Section VII.

SECTION III

GENERAL CARE AND TREATMENT

In pneumonia as in other serious diseases the patient as well as the disease should be treated. Although highly effective special remedies are now available for the treatment of the disease, good general medical and nursing care, whether or not the special remedies are applied, may turn the tide for a favorable outcome. Promoting the physical and mental comfort, conserving the strength of the patient, giving food and fluid suitable in quantity and kind, and treating symptomatically untoward conditions as they arise are important factors.

Isolation of the patient to a reasonable degree is advisable. It tends to prevent secondary infection of the patient and communication of the infection from the patient to other persons. Personal contact with the patient should be limited to those who are important in the care and treatment. A separate room should be provided for the patient when practicable. It should be clean, devoid of unnecessary furniture and fabrics, and be kept thoroughly ventilated with an abundance of fresh air but without harsh drafts and sudden marked changes in the air temperature. The sputum from the patient should be collected in cloth or paper napkins or in paper cups and burned. Attendants should wash their hands thoroughly immediately before entering and upon leaving the sick room. The wearing of clean gowns or large aprons over other clothing while in the sick room is an additional safeguard.

Hospitalization of the patient often presents definite advantages both for specific diagnosis and for therapeusis. In deciding upon hospitalization the availability of proper hospital facilities, the prospect for satisfactory arrangements for home care and treatment, and the condition of the patient at the time of contemplated transfer are to be considered. Moving a critically ill person may be a serious risk. If the transfer of the patient from home to hospital is to be made, the transfer is usually safe and generally is preferable in the early period of the disease.

The foods should be bland, readily digestible, nutritious and suited to the individual needs and uses of the patient. Inflexible stock diets are not advisable. Among foods generally suitable are milk, gruels, thin well-salted soups, eggnog, custards, and orange albumen in the active stage of the disease, and soft boiled or poached eggs, milk toast, pureed vegetables, and gradually increased more substantial food substances after convalescence begins. Sodium chloride should be given in rather liberal quantities in the food to replace that lost through excessive perspiration. The feeding should be in small quantities at short intervals, of two or three hours, while the patient is awake. As pneumonia is usually not a disease of long duration, overfeeding may be more harmful than underfeeding.

The fluid intake for an adult patient usually should total at least 3000 cc. every twenty-four hours. Water should be given in small quantities at short intervals. If the amount of fluid needed cannot be given by mouth, hypodermic or intravenous administration of glucose solution may be considered. For patients threatened with cardiac failure fluids should be given in comparatvely low amounts and not be forced.

Oxygen administration may be critically advantageous in some cases, especially those with severe cyanosis, dyspnea or delirium. If the use of an oxygen tent is not feasible, the oxygen may be administered effectively under skilled supervision with simple apparatus consisting of a nasal catheter connected with a tank containing the oxygen under high pressure and equipped with a reducing valve to control the flow of the gas.

Among drugs and measures preferably to be used in symptomatic treatment are codeine or, if it is not sufficiently effective, morphine for relief of pain, cough and restlessness; chest binders for restriction of chest movement to lessen discomfort; heat (hot water bottle or electric pad) applied locally for relief of chest pain; use of rectal tubes, enemata, turpentine stupes and physostigmine and prostigmin with pituitrin for relief of abdominal distention; catheterization for relief of urine retention; caffeine, adrenalin, epinephrine, blood transfusion, or intravenously administered glucose solution for collapse, and digitalis for cardiac stimulation but only in cases with concurrent auricular fibrillation or with previously damaged hearts.

Much of the symptomatic treatment is made unnecessary if the special chemotherapy or specific serum therapy is applied promptly and properly. The special therapies greatly lessen the severity and markedly reduce the duration of the illness in the large majority of cases of pneumonia. Therefore, they should be given first consideration and full right of way in the treatment of the disease.

SECTION IV

SELECTION OF SPECIAL THERAPY

Serum therapy and chemotherapy for pneumonia have been given extensive practical trials under rigid competent observation and their merits have been established. They have comparative advantages and disadvantages. Either, when properly applied, is highly efficacious. Among the results are lowering of the case fatality rate to less than one-third of what it would be under otherwise comparable conditions without the special therapy, shortening the period of the active disease process by more than 50 per cent on average, and lessening or preventing serious complications to a considerable degree. Chemotherapy is applicable in almost all cases but the serum therapy is especially indicated where the patient fails to respond to chemotherapy. The two may be used together to high advantage in some cases.

Type specific serum is obtained from rabbits or horses which have been immunized with the different individual types of pneumococci. Antiserum for infection with pneumococci of one type is not potent for infection due to pneumococci of any other type or to inciting agents other than pneumococci. The serum from rabbits is more potent and usually otherwise preferable to horse serum; but if serum therapy is to be administered to persons who are hypersensitive to rabbit serum the horse serum should be used. The cost of serum therapy is high—prohibitive for many persons. The administration of the serum and the preliminary sensitivity tests prescribed require quite a great deal of technical skill. The pneumococci in the sputum usually can be typed very quickly but, if more intricate and prolonged laboratory procedures are necessary to identify the organism, the delay in starting the treatment with the right specific antiserum may be serious in some cases; **hence the marked advantage of chemotherapy**—TREATMENT CAN BE STARTED BEFORE THE PNEUMOCOCCUS TYPE IS KNOWN.

The chemicals used in the chemotherapy of pneumonia are of the sulfanamide series. The first introduced was **sulfanilamide,** the next was **sulfapyridine** and the latest is **sulfathiazole.** Sul-

fapyridine proved to be more effective and less toxic than sulfanilamide and it soon became the chemical of choice. It has had extensive use and the results generally have been highly satisfactory. Sulfathiazole appears from evidence so far obtained in its use to be fully as effective as sulfapyridine and to be less toxic. At present it seems likely to supplant sulfapyridine to a large extent as the chemical of choice. Flippin's statement of the comparative frequency of the toxic manifestations of sulfanilamide, sulfapyridine, and sulfathiazole is as follows:

Reaction	*Sulfanilamide*	*Sulfapyridine*	*Sulfathiazole*
Dizziness	Common	Common	Uncommon
Nausea, Vomiting	30%	60%	20%
Cyanosis	80	20	5
Fever	9	2	4
Dermatitis	2	2	4
Psychoses	2	3	2
Conjunctivitis	—	—	2.5
Hermaturia—Microscopic	—	10	9
—Gross	—	1	—
Renal Calculi	—	0.5	0.3
Anuria with Azotemia	—	0.2	0.3
Neutropenia	0.5	0.5	—
Agranulocytosis	0.2	0.2	—
Acute Hemloytis Anemia	1.5	1	—
Mild Anemia	Common	Common	Uncommon
Hepatitis	0.5	—	—
Arthritis	—	—	0.5
Neuritis	Rare	—	—
Melena	Rare	Rare	Rare
Purpura	Rare	Rare	Rare
Diarrhea	Rare	—	—

Chemotherapy appears to be quite effective in all of the etiological types of pneumococcus pneumonia. Its effectiveness in Type 3 cases is of especial importance because serum therapy appears to be impotent in cases of that type. It is usually effective to a high degree in cases of pneumonia due to mixed infections with pneumococci among the inciting agents and to a somewhat less degree in those due to primary single infection with streptococci, staphylococci or Freidlander's bacilli. Thus, it is applicable to the vast majority of the cases of all of the pneumonias of common and frequent occurrence in this country.

As compared with the serum therapy, chemotherapy has a greater range of usefulness, is very much less expensive, is

much more easily administered, is generally more readily available, is more potent and is no more likely to be attended with specific, seriously harmful effects. As soon as the clinical diagnosis is made and before reports on specimens sent to the diagnostic laboratory have been received, chemotherapy may be employed with reasonable assurance.

In view of its definite and practical net advantages the **chemotherapy** evidently holds first place for consideration in the selection of the special therapies, with the serum therapy to be regarded usually as auxiliary to it. The use of the serum therapy is indicated especially (1) for patients known from their previous experience to be intolerant to sulfonamides; (2) for patients who do not respond favorably within forty-eight hours to the chemotherapy; (3) for patients with pre-existing hepatic or renal disease or granulocytopenia or conditions, such as those after gastro-intestinal surgery, in which vomiting would be dangerous; and (4) for patients who develop in the course of the chemotherapy serious manifestations of specific toxic reactions to the drug. Serum therapy, on the other hand, is contraindicated for patients who are known by previous experience to be or are found by the preliminary tests to be dangerously hypersensitive to the serum available for use. Fortunately, however, grave, untoward, specific reactions tending to fatality occur in only a very small percentage of patients receiving either chemotherapy or serum therapy administered with reasonable care and competence.

A combination of the chemotherapy and the serum therapy may be considered in such cases as:

1. Those in which treatment is begun after the third day of the disease.
2. Those in persons over fifty years of age.
3. Those with demonstrated bacteriemia.
4. Those with extensive involvment of more than one pulmonary lobe.
5. Those in women who are pregnant or who are in the first week of the puerperium.

The arrangements made through this cooperative program for the distribution of drugs for the treatment of pneumonia are described in Section VII.

SECTION V

CHEMOTHERAPY

Of the sulfonamide group, sulfapyridine and sulfathiazole have been found most effective and generally satisfactory for use in the treatment of most types of pneumonia.

Sulfapyridine, since its introduction two or three years ago, has been employed clinically on a large scale in this and other countries. Its merits have been well established.

Sulfathiazole, the most recent product of the sulfonamide group, has not been available sufficiently long to have had such extensive clinical use as sulfapyridine, but all evidence, both laboratory and clinical, tends to indicate that as compared with sulfapyridine it is equally as potent, though perhaps on average somewhat slower in its beneficial action. There is definite evidence that it is less toxic particularly with respect to nausea and vomiting and adverse blood changes. Recently published articles* increasingly suggest that sulfathiazole will become established as preferable to sulfapyridine for the chemotherapy of pneumonia. Pending additional evidence, both drugs will be made available throughout Tennessee for use in our pneumonia control program, the choice between the two being left to the judgment of individual physicians. The proper use of either is attended rarely with any serious risk. The same general procedures in the drug administration, for determination of beneficial effects and for recognition of specific danger signals apply to each of them.

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*Among these articles are the following:

Long, P. H.: *J.A.M.A.,* 114:870, Mar. 9, 1940.

Flippin, H. F., Schwartz, L., and Rose, S. B.: *Ann. Int. Med.,* 13:2038, May, 1940.

Finland, M., Lowell, F. C., and Strauss, E.: *New York State Jour. Med.* 40:1115, July 15, 1940.

Callomon, V. B.: *Pittsburgh Med. Bull.,* 29:458, May 18, 1940.

Abernethy, T. J.: *Med. Ann. Dist. Columbia,* 9:159, May, 1940.

Spink, W. W., and Hansen, A. E.: *J.A.M.A.,* 115:840, Sept. 7, 1940.

The following procedures in the chemotherapy of pneumonia are indicated:

Preliminaries—Arrange to start the drug as soon as the clinical diagnosis is made. The earlier in the disease the treatment is begun, the better chance the patient has for recovery. Chemotherapy, however, may prove of great benefit even if it is not begun until the late stage of the active disease process. Important among the preliminaries is a careful history with respect to previous experience of the patient with any of the sulfonamide derivatives. If the experience has been seriously unfavorable, such as the development of agranulocytosis, marked granulocytopenia, severe anemia or pronounced drug rash in the course of the treatment, serum therapy may be considered. Impaired kidney function, if not extreme, does not appear definitely as a contraindication of chemotherapy. Blood for bacteriological culture and sputum for typing should be taken if diagnostic laboratory facilities are available. Blood and sputum specimens should be taken before the treatment is begun. It is desirable also to include among the preliminaries a blood cell count, a hemoglobin determination and a urine examination. Critically important, however, is the prompt administration of the drug. In cases determined eventually to be pneumonia of some etiological form—such as virus or Rickettsia—not amenable to chemotherapy, the administration beforehand of the drug rarely will do any harm; but postponing drug administration may be of serious consequence in many of the cases of the usual and generally prevalent pneumococcus pneumonias.

Administration—Sulfapyridine and sulfathiazole are available generally in tablets of 0.5 gram (7.5 grains) each. The tablets may be taken orally as they are with a small amount of water. In some cases they are tolerated better if they are crushed beforehand and are given with five or six ounces of water, milk or fruit juice or mixed with a small quantity of some palatable food such as applesauce, syrup or honey. Some clinical observers recommend that sulfapyridine be given with an equal quantity of sodium bicarbonate and sulfathiazole with an equal quantity of sodium or potassium citrate to reduce nausea and vomiting. The drug is absorbed quickly in the stomach; hence, if vomiting occurs, as it does in perhaps 30 to 40 per cent of cases treated with sulfapyridine and in a much

smaller proportion of those treated with sulfathiazole, enough drug usually is absorbed to be effective. Often the vomiting will lessen or cease as the treatment is continued.

For an adult the initial dose is usually 2 grams (30 grains or 4 tablets) of sulfapyridine or 3 grams (45 grains or 6 tablets) of sulfathiazole. The initial dose is repeated four (4) hours later. Treatment thereafter should be 1 gram (2 tablets) of the drug every four hours day and night until the patient's temperature has been normal for at least forty-eight hours, and there is a marked amelioration of other symptoms. After this, 1 gram (15 grains or 2 tablets) should be given every six hours for at least two days if the patient can tolerate it. If favorable results (including marked reduction of fever and amelioration of other symptoms) are to follow chemotherapy they usually become manifest within 18 to 48 hours. In general, the amount of the drug required for the average patient is about 25 grams of sulfapyridine or a slightly larger amount of sulfathiazole. In cases with a spreading lesion or with bacteriemia, larger dosage—even up to 40 grams or more of either drug—may be needed. As a rule the administration of the drug can be discontinued after about 96 hours. It is advantageous, if facilities are availible, to have blood level determinations made every 12 to 24 hours in the course of treatment with sulfapyridine. The findings furnish a basis for determining the dosage needed in exceptional cases. A blood level of from 4 to 6 mg. per 100 cc. is considered adequate and a level of 10 to 15 mg. the upper limit of safety. If it is found that a sufficient level is not being reached in sulfapyridine treated cases through the usual method of administration or if in cases to be treated with sulfathiazole there is bacteriemia or the patient is in an advanced stage of the disease when first seen, a single-dose intravenous treatment may be considered. The preparation preferable for intravenous administration is a 5 per cent saline solution of sulfathiazole sodium given in a quantity to carry 0.06 gram (1 grain) of the drug per kilogram (2.2 pounds) of the body weight of the patient. An adult patient throughout the period of treatment with either sulfapyridine or sulfathiazole should be given at least 2500 cc. of fluid each twenty-four hours.

For infants and children the initial dose should be 0.25 gram (4 grains) of sulfapyridine or 0.30 gram (5 grains) of sulfathia-

zole for each ten pounds of body weight. This should be followed with maintenance doses each of about 0.15 gram (2.5 grains) of either the sulfapyridine or the sulfathiazole for each ten pounds of body weight at intervals of four to six hours.

Danger Signals and Precautions—In the chemotherapy of pneumonia a powerful drug is used to combat a dangerous disease. Through the proper use of this drug the vast majority of cases of pneumonia will be altogether benefited and many lives will be saved, but in a very small percentage of cases the drug causes specific toxic effects which, if not recognized early and treated duly, may be of grave consequence.

Among the more serious toxic effects are agranulocytosis, marked granulocytopenia, hemolytic anemia and damage to the uriniferous system.

The two means to detect these danger signals are (1) careful personal observation of the patient and (2) repeated laboratory examinations of the blood and urine. The development of a pronounced dermatitis, which may be mobiliform or scarlatinal or an erythema nodosum, can be observed readily and is usually considered an indication to suspend the use of the drug.

The attending physician should see the patient at least once daily while the drug is being given. An intelligent lay attendant to the patient may be instructed to make important observations. A marked paling of the mucous membranes of the eyelids and lips is an important danger signal. Every passage of the urine should be examined for cloudiness and macroscopic blood and the amount passed every twenty-four hours should be measured. Blood in the urine or a decrease in the twenty-four hour output of an adult to less than 1000 cc. is to be taken usually as an indication to suspend the therapy, particularly if the fluid intake has been satisfactory.

Laboratory examinations should be made of blood and urine specimens taken immediately before starting treatment and should be continued daily throughout the period of the chemotherapy if possible. The blood examinations should include a hemoglobin determination, and red, white, and differential cell counts. If the patient is found on the first blood examination to have marked hemolytic anemia or agranulocytosis or marked granulocytopenia the administration of a sulfonamide drug is

contraindicated. If one of these conditions develops to a marked degree in the course of treatment, the drug should be stopped and appropriate treatment, including perhaps blood transfusion, started promptly. In some cases of pneumonia a considerable decrease in the granulocytic leukocyte count occurs during the active disease process without being due to the effect of any drug. A decrease in the leukocyte count to less than 4500 before the temperature becomes normal in cases receiving chemotherapy and a decrease in the proportion of the polymorphonuclear cells to less than 50 per cent in adults or 40 per cent in children in the course of the chemotherapy are to be regarded with concern. In patients responding favorably to the chemotherapy there is usually a marked decrease in the leukocytosis as the fever and other symptoms subside. Therefore, the laboratory findings should be interpreted with due consideration of the clinical condition of the patient.

SECTION VI

SERUM THERAPY

Although chemotherapy has already replaced serum therapy in the treatment of pneumonia to a large extent, serum therapy continues to have an important field of usefulness. The special indications for serum therapy, either alone or in combination with chemotherapy, are set forth in Section IV of this pamphlet.

The following procedures for the use of serum in the treatment of pneumococcus pneumonia should be considered:

Preliminaries—The type of the pneumococcus causing the disease must be determined. A blood culture and sputum specimen should be submitted to the laboratory as soon as the disease is definitely suspected. The specific type of pneumococcus can usually be determined by typing the sputum. The results of the blood culture, whether positive or negative, give important information with respect to the required dosage of the serum.

The history of the patient should be obtained regarding asthma, hay fever, eczema, urticaria and angioneurotic edema. Persons subject to any of these disorders are likely not to tolerate serum well and should be given serum only under carefully guarded circumstances. The history of the patient should be obtained also regarding any previous serum treatment. A person who has had an unfavorable reaction from previous serum treatment or gives a history of hypersensitiveness to horse or rabbit emanations should not be given serum from the corresponding animal source. A person who has been given seven days to three months previously an injection of horse serum or rabbit serum should not be given serum from the corresponding animal source.

Regardless of previous history, a decision to administer serum should not be reached until after an appropriate specific sensitivity test has been made and found negative. A positive sensitivity test means that serum therapy would be attended with serious risk. A negative sensitivity test means in the

absence of a definitely contraindicating history that the serum therapy is permissible. Sensitivity very rarely is found among persons who give negative reactions to properly selected and applied sensitivity tests. Three sensitivity tests are used, (1) the ophthalmic, (2) the intradermal, and (3) the intravenous. At least one of them should be applied to every patient before the serum therapy is begun.

The **ophthalmic test** is the easiest to apply. In making the test, first observe carefully both eyes of the patient for any evidence of inflammation or congestion of the conjunctivae. Then drop into the conjunctival sac near the outer canthus of one eye one drop of a 1:10 dilution (in physiological salt solution) of the serum, leaving the other eye as the normal control. The test serum should be taken either from a supply of normal serum of the appropriate animal source or from a lot of that which is contemplated for use in treating the patient. A positive reaction will cause itching, watering and diffuse reddening of the eye within an hour or two. If severe, it may be controlled by the application of a drop or two of 1:1000 solution of adrenalin chloride. This test is not satisfactorily applicable to a patient with conjunctival congestion of such marked degree as to interfere with the proper reading of a positive reaction or to a child who by crying may cause the serum to be washed out before it would have time to act.

The **intradermal test** is of use especially for patients to whom the ophthalmic test is not applicable or among whom the ophthalmic test has given a doubtful reaction. It is more sensitive than the ophthalmic test and will give a larger proportion of doubtful reactions. In a patient with a negative reaction to the ophthalmic test and with a doubtful or mildly positive reaction to the intradermal test a reasonably safe interpretation is that that patient is not dangerously sensitive. Either a positive ophthalmic test or a strongly positive intradermal test is a definite indication that the serum therapy would be attended with serious risk. A negative ophthalmic and a positive intradermal test along with a history of asthma or hay fever contraindicates the use of serum. In performing the intradermal test the first procedure is to inject into (not under) the skin of the anterior surface of one forearm an amount of physiological salt solution sufficient to produce a small white eleva-

tion. This is the control injection. Then inject similarly into the skin of the corresponding area of the other forearm an equal amount of a 1:100 dilution (with physiologic salt solution) of **normal** serum from the appropriate animal source. In negative tests both of the elevations tend to disappear within a few minutes with the elevation produced by the serum dilution, subsiding usually somewhat less quickly than that produced by the saline solution. In positive tests the elevation at the site of the serum injection increases and becomes a genuine urticarial wheal with surrounding erythema within five to twenty minutes from the time of the injection. Fingerlike extensions of the central wheal are considered evidence of the higher and more dangerous degrees of sensitivity.

The **intravenous test** is regarded by some clinicians as an important additional precaution in the use of rabbit serum. To conduct it, 0.1 cc. of the therapeutic serum is diluted to 5.0 cc. with physiologic salt solution and injected slowly into a vein. The rate of injection should not exceed 1 cc. per minute. Blood pressure readings and pulse counts are made before, during and after the injection. The development of symptoms of shock or a marked drop in the blood pressure or a marked rise in the pulse rate during or promptly after the injection contraindicates the therapeutic use of the serum.

Persons highly sensitive to a serum may develop grave allergic symptoms even when a very small amount of serum is given. **Adrenalin solution should always be available for immediate use when serum testing or treatment is being done.** Serum is contraindicated for persons in extremis. Antiserum, the specific type to be determined by sputum typing or by a blood culture, when used, should be given as early as possible in the disease.

Administration—Type specific antisera are procurable for the treatment of the pneumonias caused by most of the different types of pneumococci. They vary greatly in efficiency. Serum for Type 1 pneumococcus infection has had extensive use and appears to be the most efficient. The others in order of efficiency appear to be with Types 2, 5, 7, 8, and 14 in the order listed. The others are of questionable value.

Rabbit serum, unless specifically contraindicated, should be given definite preference over horse serum. It averages higher in potency, and lower in risk, and it is more concentrated.

In the initial administration of serum to adult patients the number of units should be at least 60,000 for Type 1 pneumococcus pneumonia, at least 80,000 for Type 7 and at least 100,000 for all other types. As adequate dosage early in the disease is most important, a good practical rule probably would be to give at least 100,000 units for any of the infection types. The dosage should be greatly increased (1) if treatment is begun after the third day of the disease, (2) if the patient is over 40 years of age, (3) if the patient is pregnant or in the first week of the puerperium, (4) if there is involvement of more than one lobe, or (5) if pneumococcus bacteriemia is known to be present. The dosage for infants and children should be usually about one-half that prescribed for adults.

The intravenous route is the method of choice and should be used if possible. If intramuscular injection is required, as it may be in children or obese persons, the units given should be double the usual intravenous dosage. In the first intravenous injection 2 cc. of the serum warmed to body temperature should be administered. The serum should be injected slowly, at a rate of 1 cc. per two minutes. Following the first injection an interval of two hours is allowed to elapse and, if no untoward reaction has occurred, the second injection then is given and two hours after the second injection the third injection is given. Both the second and third injections should be given slowly, each through a period of 5 to 10 minutes. The volume of serum in the first and second injections together should be enough to convey one-third and that in the third injection enough to convey the remaining two-thirds of the unit dosage (60,000 to 100,000 or more units) estimated to be needed in the first period of administration. As a rule, a single injection of the serum should not exceed 50 to 60 cc. in volume.

The need for subsequent injections after the first period of administration described above must be determined by the condition of the patient. The behavior of the temperature and pulse and the outcome of blood cultures and of the polysaccharide skin test are guides for the administration of more serum.

If the patient is to respond favorably to serum therapy as described above, improvement should be noted within 8 to 24 hours after the last dose is given. When the favorable response occurs, the temperature falls rapidly, the pulse rate becomes slower, the toxemia lessens and the area of consolidation ceases to extend. If the favorable response does not begin within twelve hours after the third injection, more serum is needed as a rule.

Danger Signals and Precautions—All patients receiving serum should be kept under close observation by the physician for at least 45 minutes following each injection. If during the injection or shortly thereafter the patient complains of lumbar or abdominal pain or shows evidence of urticaria, dyspnea, cyanosis, or collapse the serum should be discontinued and adrenalin chloride given at once. A 1-1,000 adrenalin chloride solution should always be available for immediate use. The dose is 1 cc. for an adult and correspondingly less for a child. It may be given subcutaneously or intravenously, depending upon the severity of the reaction. For relief of an anaphylactic reaction there may be needed, in addition to the adrenalin, artificial respiration and measures to combat shock (including the application of heat, etc.) if collapse occurs.

If a thermal reaction results from the serum therapy it usually appears within twenty minutes to an hour and a half following a serum injection and begins with a chill. If hyperpyrexia follows the chill or develops without a preceding chill, immediate treatment is essential. Adrenalin is of no use for such a condition, but procedures for the treatment of heat stroke are indicated, including the use of ice packs, application of sheets wrung from ice water, and ice water enemas.

Another reaction which may result from the serum therapy is the so-called "serum disease." This is manifested by urticaria, which usually is of a very pronounced type, and along with it in some cases are fever, enlarged glands and joint pains. It may appear at any time within four weeks after serum has been given but it occurs most commonly between the fourth and tenth days. It is not particularly serious and usually continues for only a day or two but it is quite discomforting to the patient.

General Applicability—In view of the complexities and difficulties of the serum therapy, especially outside thoroughly equipped hospitals, it is fortunate that now with readily available means for the simpler, much less costly and more effective chemotherapy, which may be applied practically and to a very large degree successfully under usual conditions of home care, the need for the serum therapy will be critically important for only a very small proportion of cases of pneumonia in Tennessee.

SECTION VII

ESSENTIAL FEATURES OF A PNEUMONIA CONTROL PROGRAM

Including Plans for Cooperative Assistance to Private Physicians

Although pneumonia control does not at the present time mean pneumonia prevention in the usual sense, due to the lack of an immunity producing agent, it is hoped that the time will come when efforts can be directed mainly to the prevention of the disease.

It is the responsibility of the physician and health department to teach the public the predisposing factors of pneumonia and the safeguards against these factors. It is important to teach the fact that pneumonia is a communicable disease and may be spread to other members of a family and to contacts. The isolation of the patient and the use of concurrent disinfection should be emphasized.

To be effective, a pneumonia control program must provide for the following:

1. Training of physicians in modern diagnostic and treatment methods.

2. Teaching the public that, for treatment to be most effective, it must be started early in the course of the disease.

3. Providing a therapeutic agent for use in the treatment of selected cases.

4. A study of cases and deaths from pneumonia in order to evaluate the program and to make improvements where needed.

It is only through the whole-hearted and sincere cooperation on the part of the public, the doctor, and the health department that pneumonia mortality can be reduced on a reasonably desirable scale.

The following services are now available to the physicians of this State:

Laboratory Services for the Diagnosis of Pneumonia

Accurate laboratory service requires: competent laboratory personnel; adequate laboratory equipment; and satisfactory specimens for examination.

Special specimen containers are available to physicians upon request for the submission of blood for culture and sputum for typing to the proper regional laboratory of the Tennessee Department of Public Health. Physicians living in cities and counties with full-time health service can obtain containers from the local health department. Physicians living in unorganized areas should requisition these from the branch laboratory serving that area. The double container contains a specimen bottle with culture media for the blood culture and a bottle for collecting sputum for typing. A container with a sterile cotton applicator in a glass tube is available for obtaining throat swabs from children when it is impossible to obtain a sputum specimen. Blood and sputum specimens should be taken routinely before treatment is started, if possible. All specimens should be kept at body temperature and delivered to the laboratory at the earliest possible time after collection.

A LIST OF STATE LABORATORIES PROVIDING THIS SERVICE CAN BE FOUND ON PAGE 36.

1. **Collection of blood culture specimen:**

Follow the same procedure used in the collection of a blood Wassermann, taking care to see that the patient's skin, the needle and the syringe are sterile. Five to eight cubic centimeters of blood are required. DO NOT REMOVE THE RUBBER DIAPHRAGM STOPPER FROM THE CULTURE BOTTLE. Sterilize the stopper with alcohol or iodine, insert the needle **through** the stopper and inject the blood into the culture media. Every effort should be made to prevent contamination and chilling the specimen.

2. **Collection of sputum specimen:**

The sputum should be expectorated material coming from the lungs with as little admixture of saliva as possible. Rusty or "prune juice" sputum is the most satisfactory type for examination. In order to assure a good examination, an amount equal to

at least one teaspoonful should be collected directly in the special container provided. **It should not be collected on cloth or paper, or in another container and transferred to the specimen bottle.** If the patient has some difficulty in raising sputum, irritation of the pharynx may induce coughing or retching and a sample may then be obtained. A hot drink given to the patient or placing him in a lateral position may promote expectoration.

3. **Collection of sputum for type determination from children where it is impossible to obtain an expectorated specimen:**

Take the applicator from the container and swab the posterior pharyngeal wall. Often this will induce coughing or retching on the part of the patient and material will collect on the swab. If this does not occur, it is possible that the organisms may be obtained on the applicator through the process of swabbing the pharynx. After obtaining the specimen the end of the applicator should be broken off, the applicator placed in the glass tube, and the stopper reinserted.

Distribution of Drugs

Sulfapyridine and sulfathiazole will be made available to physicians without cost for the treatment of pneumonia cases. While free drugs are primarily for use in the economically dependent group, the decision as to whether or not the individual patient should receive free drugs is left to the discretion of the attending physician. The drug will be supplied in 7½ grain tablets in maximum lots of 50 tablets for adults and 25 tablets for children. The only prerequisite for obtaining the drug is that the physician must report each case for which the drug is requested. The use of the drug furnished must be **positively restricted to the treatment of pneumonia.** The following form is required for case reporting and requesting drugs.

TENNESSEE DEPARTMENT OF PUBLIC HEALTH
PNEUMONIA CONTROL SERVICE

DRUG REQUESTED AND REPORT OF CASE Date_____

The following drug:_____tablets of _____are requested for
(Specify sulfapyridine or sulfathiazole)
Name_____ Color_____ Sex_____ Age_____
Town or
Address_____ City_____ County_____
Date of
Diagnosis_____ Onset_____
(Type of pneumonia: lobar, broncho, etc.)
Contributory Date of
Condition_____ Onset_____
(Measles, pertussis, influenza, etc.)
Signed_____M.D., Address_____

DRUG FURNISHED

This is to certify that_____tablets of _____were furnished for the above case.

Signed_____ Address_____
(Distributor)

The method of distribution of drugs will vary, depending upon whether or not there is a full-time health service in the area. The drugs will not be distributed for the treatment of any other disease.

1. **Distribution of drugs in cities and counties with full-time health service:**

In cities and counties with full-time health service, the health department will act as the distribution agent. The physician may obtain in advance a supply of sulfapyridine or sulfathiazole sufficient for the treatment of one patient. When treatment of the first case is begun, he should request an additional supply and report the case under treatment, using the combined case report and drug request form. In this way the physician will be able to have a supply of the drug available at all times. A list of the city and county health departments appears on page 33.

2. **Distribution of drugs in cities and counties without full-time health service:**

In areas not served by full-time health department, the physician can obtain the drug from the local distributing agent,

who will be a druggist, usually located in the county seat. Before obtaining the drug for each patient, it will be necessary for the physician to complete the combined report and request card shown above. Each druggist-distributor will be furnished a supply of these cards. A list of the distribution agents (druggists) by counties appears on page 35.

In order to get accurate information regarding the outcome of all cases treated, a brief follow-up questionnaire will be sent to each physician. This information will be tabulated and made available to the Committee on Pneumonia Control of the Tennessee State Medical Association for study of the effectiveness of the present control program and for making changes as indicated in the future. The form for use in the collection of this information is shown herewith.

TENNESSEE DEPARTMENT OF PUBLIC HEALTH
PNEUMONIA CONTROL SERVICE

CLINICAL REPORT OF CASE

Name_____ Color_____ Sex_____ Age_____
Address_____ County_____
Date of
Diagnosis_____ Onset_____
(Type of pneumonia: lobar, broncho, etc.)
Contributory Date of
Condition_____ Onset_____
(Measles, pertussis, influenza, etc.)
Treated: Home_____ Hospital_____
Complications: 1. Pleural Effusion_____ 2. Empyema_____
3. Otitis Media_____ 4. Other_____
(Specify)
Amount of
Drug Used: Sulfapyridine_____tablets; sulfathiazole_____
1st date
tablets; given_____
Drug
Reactions: 1. Vomiting____; 2. Leukopenia____; 3. Anemia_____;
4. Hematuria_____; 5. Skin rash_____; 6. Other_____
(Specify)
If sputum was typed, give results_____
(Types I, II, etc.)
Outcome: Recovered_____; Died_____; Date of death_____
Signed_____M.D., Address_____

DISTRIBUTORS FOR DRUGS IN AREAS WITH FULL-TIME HEALTH SERVICE

City or County	*Address*	*Distributor*
Anderson	Clinton	Anderson County Health Department
Bledsoe	Pikeville	Bledsoe County Health Department
Blount	Maryville	Blount County Health Department
Bradley	Cleveland	Bradley County Health Department
Campbell	LaFollette	Campbell County Health Department
Carter	Elizabethton	Carter County Health Department
Chattanooga	City Hall, Chattanooga	Chattanooga City Health Department
Claiborne	Tazewell	Claiborne County Health Department
Clay	Celina	Clay County Health Department
Cocke	Newport	Cocke County Health Department
Crockett	Alamo	Crockett County Health Department
Cumberland	Crossville	Cumberland County Health Department
Davidson	Court House, Nashville	Davidson County Health Department
Decatur	Decaturville	Decatur County Health Department
Dyer	Dyersburg	Dyer County Health Department
Fayette	Somerville	Fayette County Health Department
Fentress	Jamestown	Fentress County Health Department
Franklin	Winchester	Franklin County Health Department
Gibson	Trenton	Gibson County Healtb Department
Giles	Pulaski	Giles County Health Department
Grainger	Rutledge	Grainger County Health Department
Greene	Greeneville	Greene County Health Department
Grundy	Pelham	Grundy County Health Department
Hamblen	Morristown	Hamblen County Health Department
Hamilton	Court House, Chattanooga	Hamilton County Health Department
Hardeman	Bolivar	Hardeman County Health Department
Hardin	Savannah	Hardin County Health Department
Hawkins	Rogersville	Hawkins County Health Department
Henderson	Lexington	Henderson County Health Department
Hickman	Centerville	Hickman County Health Department
Houston	Erin	Houston County Health Department
Humphreys	Waverly	Humphreys County Health Department
Jackson	Gainesboro	Jackson County Health Department
Jefferson	Dandridge	Jefferson County Health Department

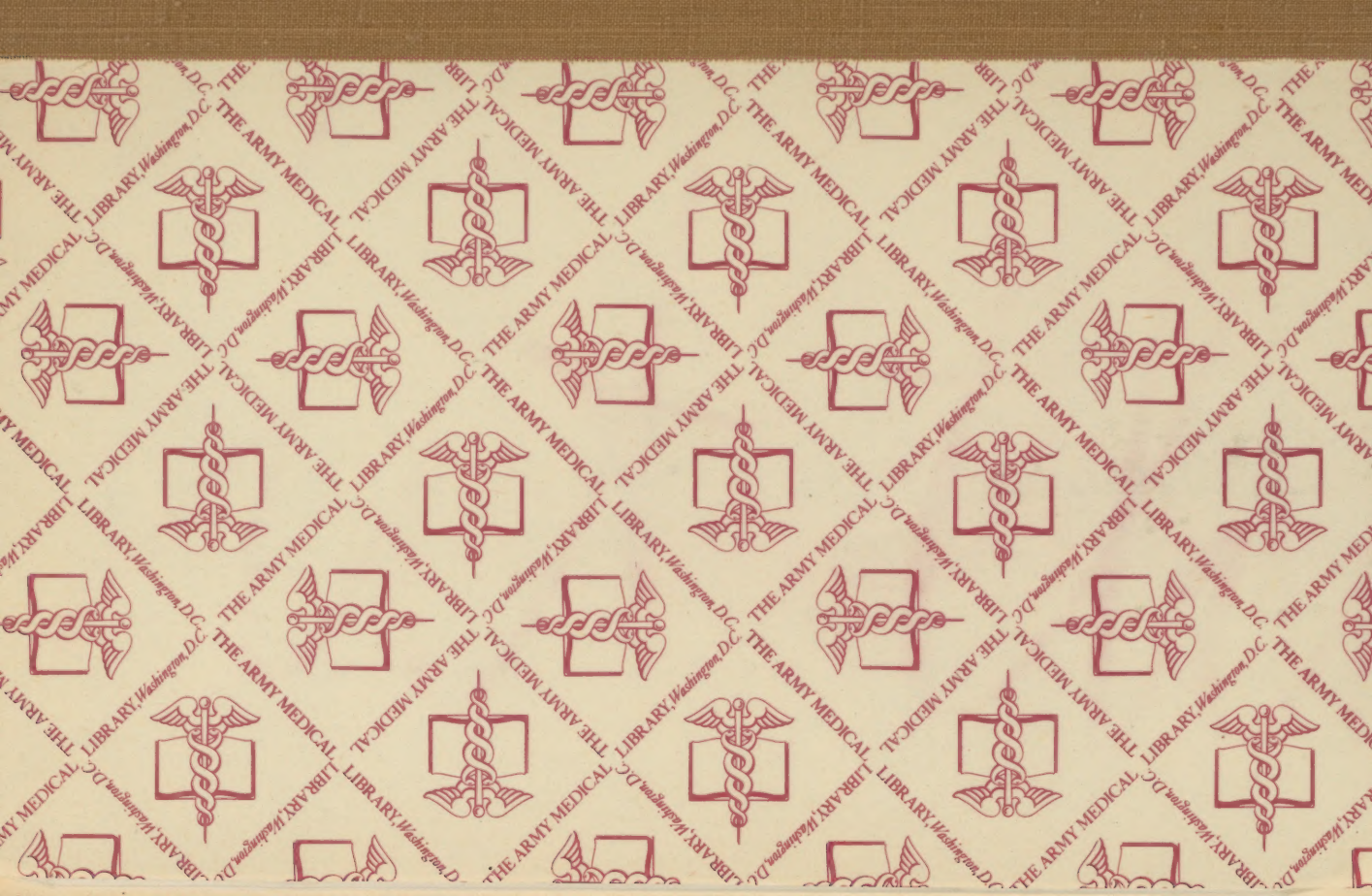
City or County	*Address*	*Distributor*
Johnson	Mountain City	Johnson County Health Department
Knox	Court House, Knoxville	Knox County Health Department
Knoxville	309 Market Street, Knoxville	Bureau of Health, Knoxville
Lake	Tiptonville	Lake County Health Department
Lauderdale	Ripley	Lauderdale County Health Department
Lincoln	Fayetteville	Lincoln County Health Department
McMinn	Athens	McMinn County Health Department
Macon	Lafayette	Macon County Health Department
Marshall	Lewisburg	Marshall County Health Department
Maury	Columbia	Maury County Health Department
Meigs	Decatur	Meigs County Health Department
Memphis	Court House, Memphis Room 105	Memphis City Health Department
Monroe	Madisonville	Monroe County Health Department
Montgomery	Clarksville	Montgomery County Health Department
Morgan	Wartburg	Morgan County Health Department
Nashville	2nd & Lindsley, Nashville	Nashville City Health Department
Obion	Union City	Obion County Health Department
Overton	Livingston	Overton County Health Department
Pickett	Byrdstown	Pickett County Health Department
Rhea	Dayton	Rhea County Health Department
Roane	Kingston	Roane County Health Department
Rutherford	Murfreesboro	Rutherford County Health Department
Sequatchie	Dunlap	Sequatchie County Health Department
Sevier	Sevierville	Sevier County Health Department
Shelby	Room 117 Court House, Memphis	Shelby County Health Department
Sullivan	Blountville	Sullivan County Health Department
Sumner	Gallatin	Sumner County Health Department
Tipton	Covington	Tipton County Health Department
Trousdale	Hartsville	Trousdale County Health Department
Unicoi	Erwin	Unicoi County Health Department
Washington	Jonesboro	Washington County Health Department
Weakley	Dresden	Weakley County Health Department
Williamson	Franklin	Williamson County Health Department
Wilson	Lebanon	Wilson County Health Department

DISTRIBUTORS FOR DRUGS IN AREAS WITHOUT FULL-TIME HEALTH SERVICE

County	*Address*	*Distributor (Druggist or Other)*
Bedford	Shelbyville	Blue Front Drug Store
Benton	Camden	Fry Drug Company
Cannon	Woodbury	Bratten McCrary Drug Company
Carroll	Huntingdon	Priest & Townes Drug Company
	McKenzie	Covington Drug Company
Cheatham	Bennie Dillon Bldg., Nashville	Massey Surgical Supply Company
Chester	Henderson	City Drug Company
Coffee	Manchester	Baker Brothers Drug Company
	Tullahoma	Taylors Pharmacy
DeKalb	Smithville	F. Z. Webb & Sons
Dickson	Dickson	Jackson Drug Company
Hancock	Sneedville	Coy M. Seal Drug Company
Haywood	Brownsville	Reid Drug Company
Henry	Paris	McSwain Brothers Drug Company
Lawrence	Lawrenceburg	Braley Drug Company
Lewis	Hohenwald	B. & O. Drug Company
Loudon	Lenoir City	Geo. B. Day Drug Company
McNairy	Selmer	Browder Brothers Drug Company
Madison	Jackson	White Drug Company
Marion	Jasper	Jasper Drug Company
Moore	Tullahoma	Taylors Pharmacy
Perry	Linden	Goodwin Drug Company
Polk	Ducktown	Kimsey Pharmacy
Putnam	Cookeville	Marchbanks Drug Company
Robertson	Springfield	Alley & Hopson Drug Company
Scott	Oneida	Horace F. Cooper Drug Company
Smith	Carthage	Read Brothers Drug Company
Stewart	Dover	Burton Drug Company
Union	Tazewell	Claiborne County Health Department
Van Buren	Spencer	Nelson Drug Company
Warren	McMinnville	Hutchins Davies Drug Company
Wayne	Waynesboro	Heltons Drug Company
White	Sparta	Nelson Drug Company

TENNESSEE DEPARTMENT OF PUBLIC HEALTH LABORATORIES

Name	*Address*
Chattanooga Branch Laboratory	City Hall, Chattanooga
Johnson City Branch Laboratory	East Tennessee Teachers College, Johnson City
Knoxville Branch Laboratory	309 Market Street, Knoxville
Memphis Branch Laboratory	Room 303P, 874 Union Avenue, Memphis
Central Laboratory	420 6th Avenue North, Nashville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